An interesting fact is the control of artesian head by the height of ground water in the cover area, and several instances are adduced of the head being raised by true influx of surface waters. Under the most favorable conditions the head from the St. Peter and the Galena appears to reach about 675 feet A. T., while from the Potsdam it appears to rise slightly above 700 feet. Few wells in northern Illinois can be depended upon to maintain a head much exceeding 600 feet A. T. A few examples are added to the many on record of local artesian regions whose head is lowered by over draft. In the Chicago district the head of the St. Peter water has been drawn down nearly 100 feet, and this loss of pressure extends ten miles and over west and south of that part of the city where the wells are now numerous. At Joliet heavy pumping of a single well has been found to lower the head several feet in wells nearly one-half mile distant. The increase of mineralization of artesian waters with increase of distance from the area of intake is amply illustrated, sodium chloride, for instance, ranging from about three grains to the gallon at Chicago to about 30 at Rock Island and 277.7 at Barry.

Of less interest to the geologist are the chapters treating of the rainfall, the run off of the streams, and kindred topics. In the chapter on the water supply of the cities and towns, the statement that "the Chicago intakes are affected by sewage only when the Chicago River is at high stages, which seldom amounts to more than a few days each year," is certainly one that does not err from lack of moderation. The final chapter, by Professor J. A. Udden, treats with fullest detail of the artesian district of Rock Island and vicinity. The report is amply illustrated with maps and sections, and it places on permanent record a mass of valuable statistics in several fields. The details, however, are so handled that they do not interfere with the author's direct and luminous treatment of the subject. W. H. NORTON.

The Geology of Santa Catalina Island. By WILLIAM SIDNEY TANGIER SMITH. Proceedings of the California Academy of Sciences, 3d Series, Geology, Vol. I, pp. 1–71, 2 plates and map.

The chief interest in this paper lies in the clear and generally convincing manner in which the author has discussed the physiographic problems presented by his very attractive field; his work being in that respect a continuation of the previous work of Lawson.

Santa Catalina Island is one of the group known as the Channel Islands, and lies about twenty miles off the coast of southern California. Its general trend is northwest by west, with a length of twenty-one miles, and an average width of three miles. It is traversed from end to end by a dominant ridge, culminating at 2100 feet. The general character of the surface is bold and rugged, but it can be differentiated into two topographic types, the one characterized as a young topography, with steep sharp ridges and acute V-shaped canyons, and the other as an older topography, composed of rounded forms, and restricted to the higher portions of the island. In transverse section, the island shows a general slope towards the mainland; the valleys on this side are broad and open, while on the ocean slope they are "long and trough-like." The sea-cliffs, which make up the greater part of the coast line, are in such rapid recession that the narrow V-shaped canyons frequently merely gash their upper fronts, not having been allowed time to cut down to sea level.

A little more than half the island, including most of its western half, is made up of a basement series consisting of quartzite, mica-schists, talc and amphibolite-schists, and serpentine. The eastern portion is mainly occupied by an intrusive mass of porphyrite (in Iddings' sense) with accompanying dioritic dykes, and by andesitic flows of later date. The various intrusive and effusive rocks are described in detail, but present few features of general interest. The occurrence of a small area of rhyolite is noteworthy on account of the few cases in which rocks of this character have been described in the Coast Range region of California. Its age relative to the andesite was not determined. Some small areas of light-colored shale were found on the northeast side of the island, associated with volcanic tuffs, and were correlated with the widespread Miocene shale of the Coast Ranges. In this case the shale is shown to contain over 70 per cent. of opaline silica, and to be made up largely of diatoms and forminifera, as identified by Dr. Hinde.

The serpentines are derived from ultra basic eruptive rocks, and are associated with small amounts of blue-amphibole-schist, the latter probably the result of contact metamorphism.

In a concluding chapter the writer ably sums up the geomorphogeny of the island. Submarine contours show that the Catalina land-mass preserves its form down to a depth of 1800 feet. Near the shore the water deepens rapidly down to 250 feet. At this depth a sub-

marine platform of varying width encircles the island, beyond which the water again deepens. Submarine profiles indicate that the island began its history as an orographic block, tilted to the north, and forming a part of the mainland. It stood 2000 to 3000 feet higher than at present. Following the tilting came the intrusions of porphyrite and diorite. Erosion made considerable progress upon this tilted block, and toward the close of this period the andesitic flows were erupted, accompanied by a slow subsidence. Santa Catalina became an island, depressed, at the close of the downward movement, 1400 to 1600 feet below its present level. During the Miocene a long period of erosion reduced the unsubmerged portions to a peneplain. A gradual elevation of 1850 feet followed, with at least one pause in the movement. The last oscillation is exhibited in the present period of rapid sinking.

The discussion and exposition (very inadequately summarized in a review of this length) is in general admirable. Exception might, however, be taken to the statement, made twice within the paper, that the shortening of a stream's course by the drowning of its lower reaches will cause it to cut down into its alluvial fan.

F. L. RANSOME.

Geology of the Castle Mountain Mining District, Montana. By W. H. WEED and L. V. PIRSSON. Bull. U. S. Geol. Surv., No. 139, pp. 164, 7 plates. Washington, 1896.

Recently considerable study has been directed to the isolated mountains which form the foothills of the Rockies. Such mountain masses offer an inviting field, since they are usually much simpler than the main ranges, and by working out in detail the history of such independent centers of eruption the general order and, perhaps, the causes of differentiation in rock magmas seem likely to be easiest learned.

The Castle Mountain is a dissected volcano, now rising about 3600 feet above the surrounding plain, itself having an altitude of about 5000 feet. The mountain mass is about ten miles in diameter, and stands in central Montana between the Little and Big Belt Mountains. The stratified rocks of the region include representatives of the Algonkian, Cambrian, Silurian, Devonian, Carboniferous, Jurassic, and Cretaceous, preceding the eruption, and certain Neocene lake